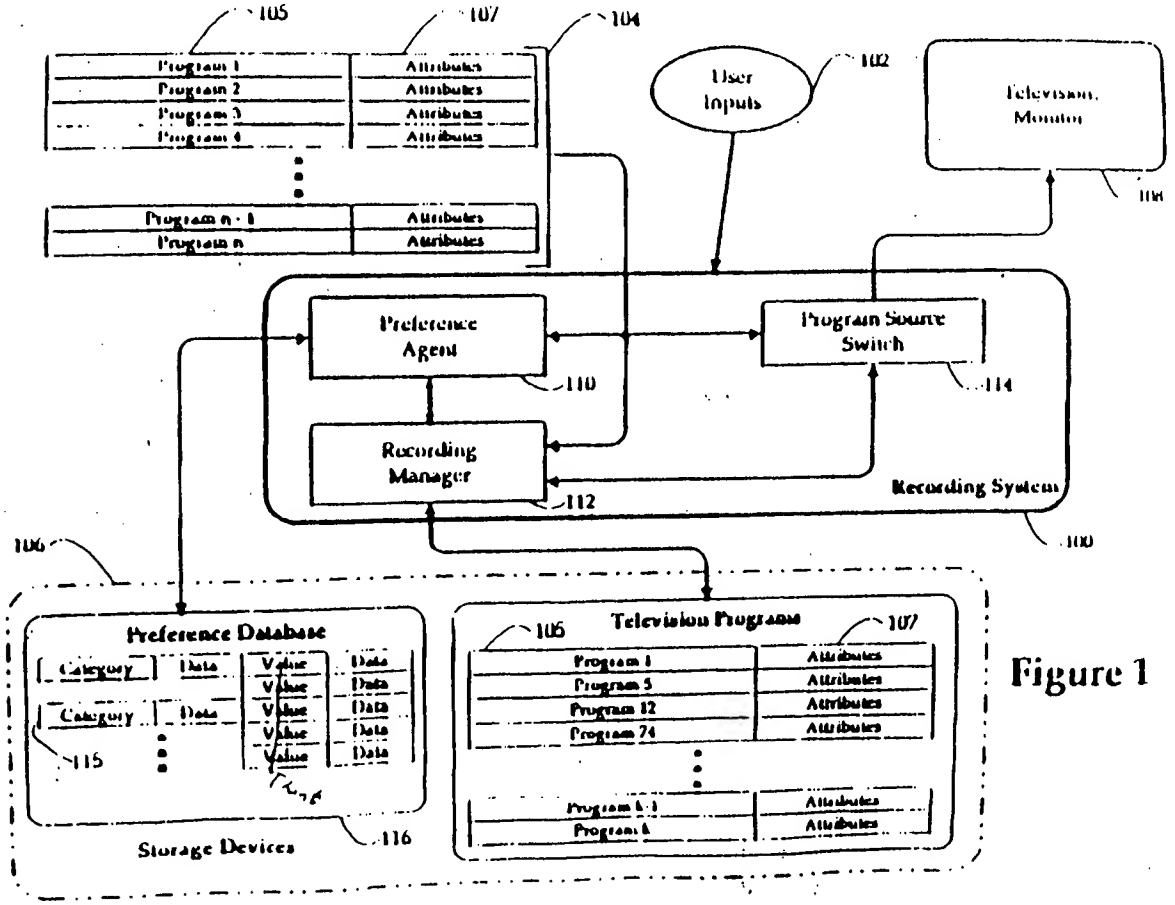

105
107
104
Program 1
Program 2
Program 3
Program 4
Attributes
Attributes
Attributes
Attributes
Program n - 1
Program n
Attributes
Attributes
User Inputs
102
Television Monitor
108
Preference Agent
110
Program Source Switch
114
Recording Manager
112
Recording System
100
106
Preference Database
Category
Data
Value
Data
115
116
Storage Devices
Television Programs
106
107
Program 1
Program 5
Program 12
Program 74
Program k - 1
Program k
Attributes

Figure 1

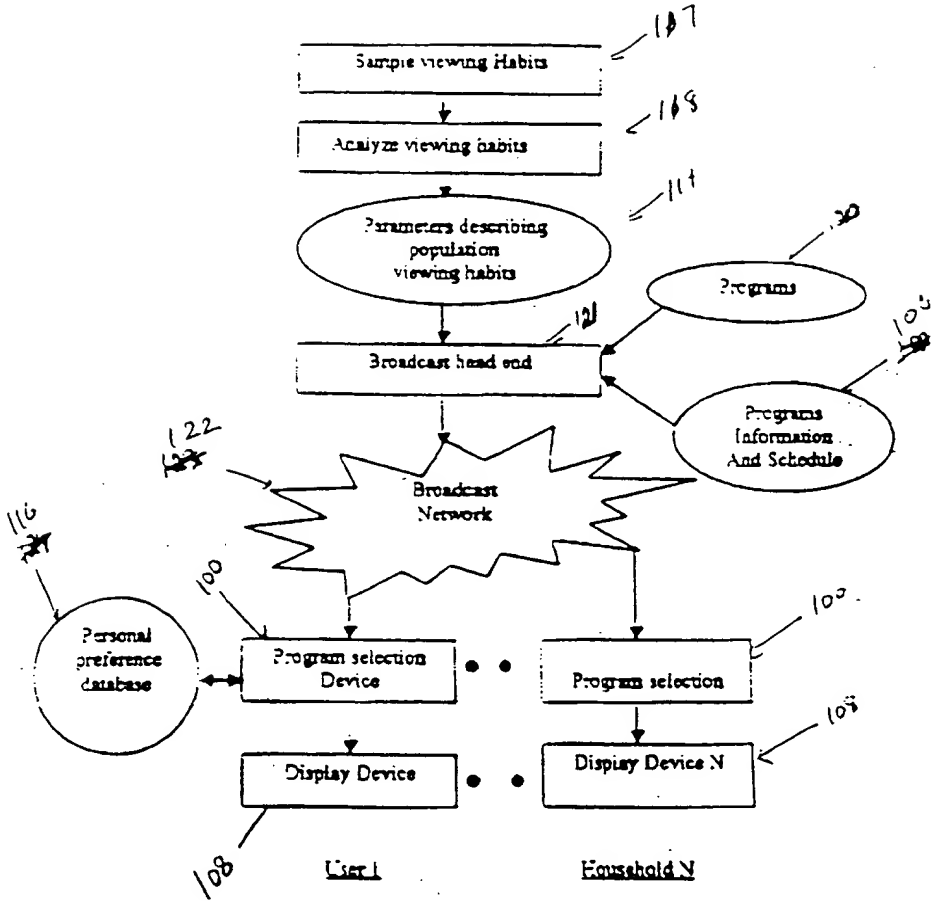

Sample viewing Habits
Analyze viewing habits
Parameters describing population viewing habits
Programs
Broadcast head end
Programs Information And Schedule
Broadcast Network
Personal preference database
Program selection Device
Program selection
Display Device
Display Device N
User 1
Household N

Figure 2

Examples of Program Information

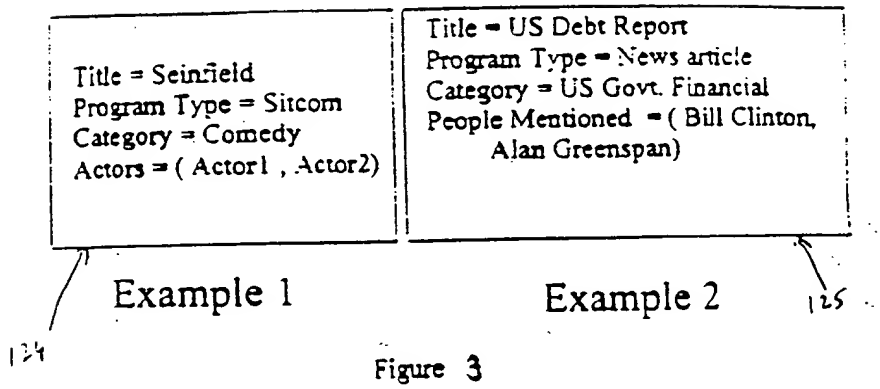


Figure 3

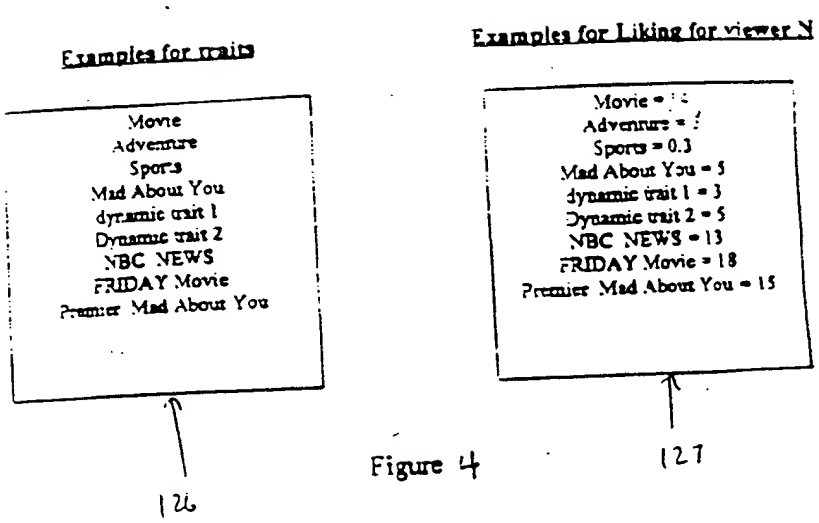

Examples for traits
Movie
Adventure
Sports
Mad About You
dynamic trait 1
Dynamic trait 2
NBC NEWS
FRIDAY Movie
Premier Mad About You
126
Examples for Liking for viewer N
Movie =
Adventure =
Sports = 0.3
Mad About You = 5
dynamic trait 1 = 3
Dynamic trait 2 = 5
NBC NEWS = 13
FRIDAY Movie = 18
Premier Mad About You = 15
127

Figure 4

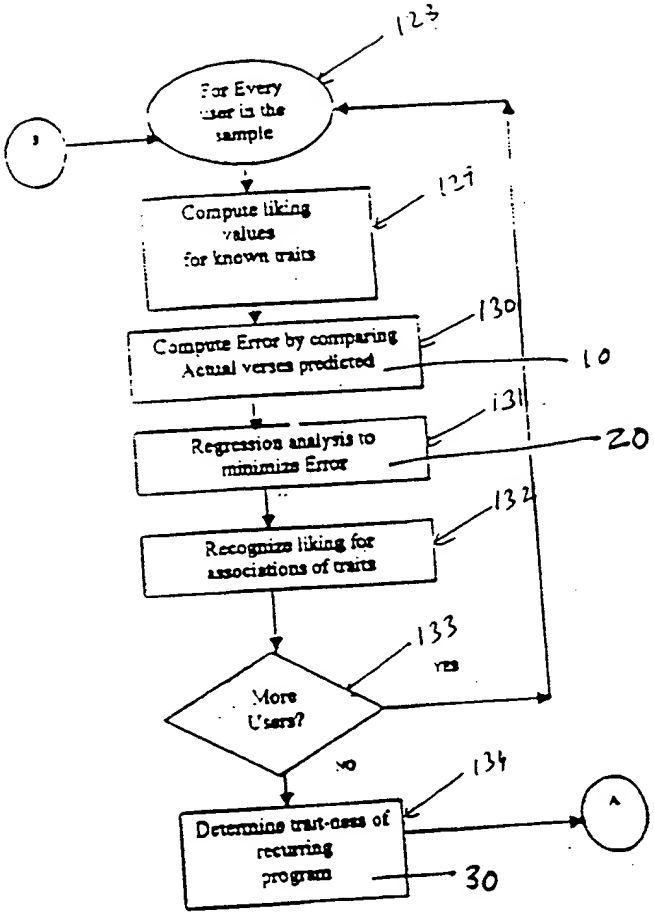

123
For Every User in the sample
3
127
Compute liking values for known traits
130
Compute Error by comparing Actual verses predicted
10
131
Regression analysis to minimize Error
20
132
Recognize liking for associations of traits
133
yes
More Users?
no
134
Determine trait-mass of recurring program
30
A

Figure 5(a)

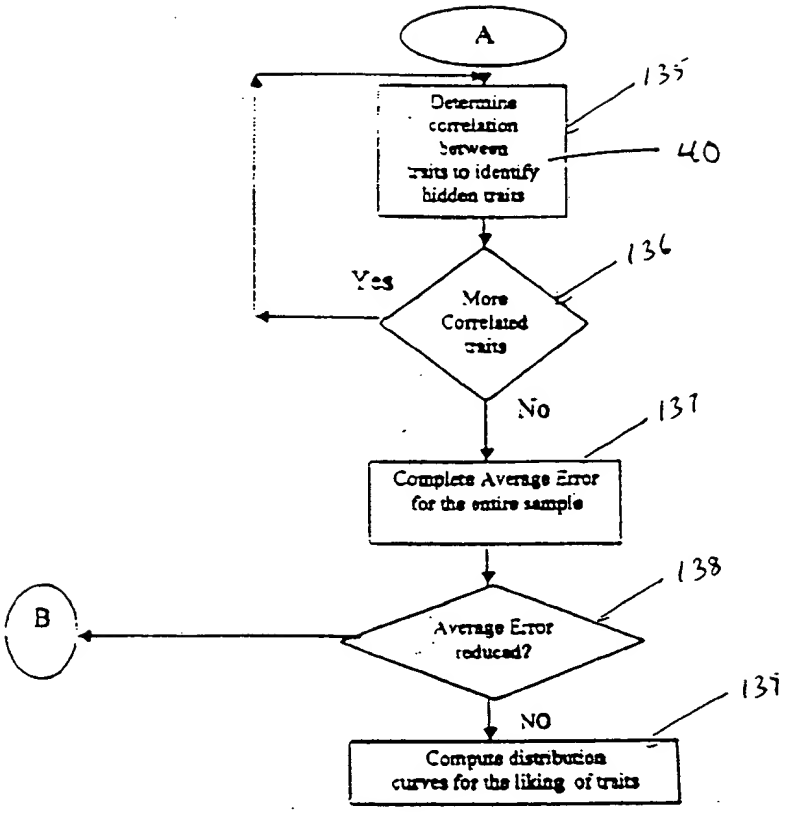

A
135
Determine correlation between traits to identify hidden traits
40
136
Yes
More Correlated traits
No
137
Complete Average Error for the entire sample
138
B
Average Error reduced?
139
NO
Compute distribution curves for the liking of traits

Figure 5 (b)

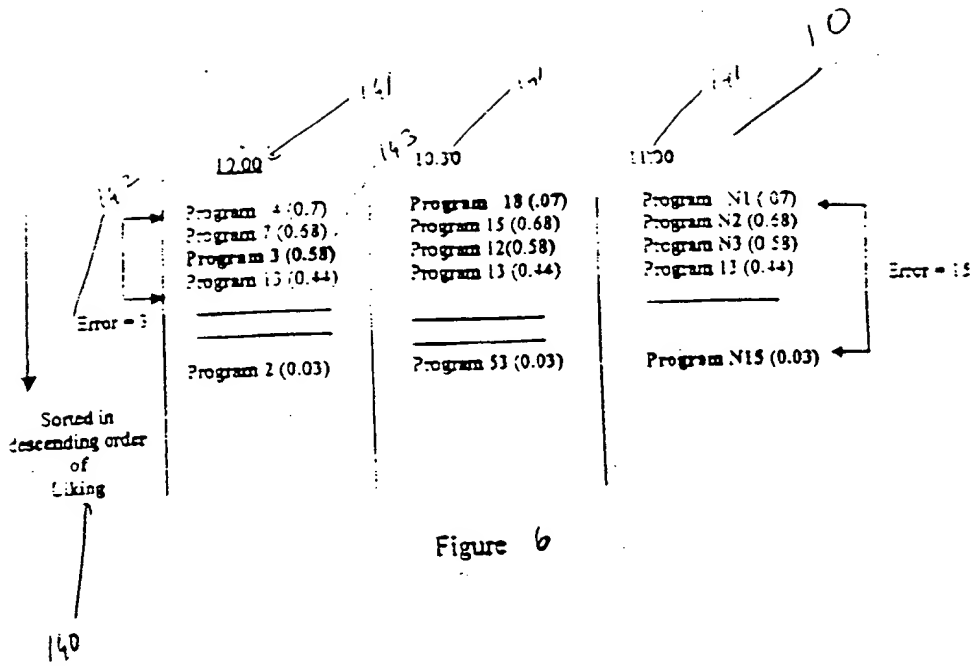

10
141
141
141
12:00
10:30
11:00
142
143
Program 4 (0.7)
Program 7 (0.58)
Program 3 (0.58)
Program 13 (0.44)
Program 18 (.07)
Program 15 (0.68)
Program 12(0.58)
Program 13 (0.44)
Program N1 (07)
Program N2 (0.58)
Program N3 (0.58)
Program 13 (0.44)
Error = 3
Error = 15
Program 2 (0.03)
Program 53 (0.03)
Program N15 (0.03)
Sorted in descending order of Liking
140

Figure 6

RADIO

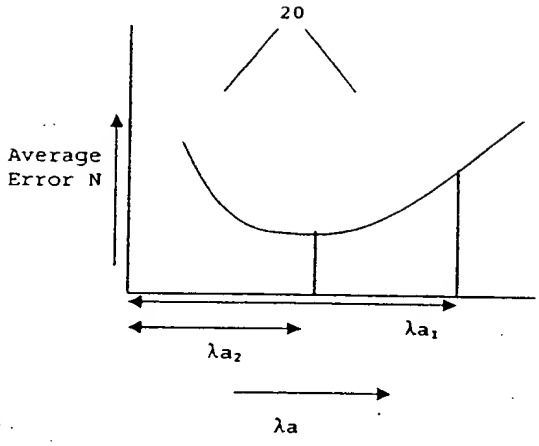
Figure 7

Current Liking Value

$\lambda a_1 = 2$
$\lambda b_1 = 5$
$\lambda c_1 = -3$
$\lambda d_1 = 0$

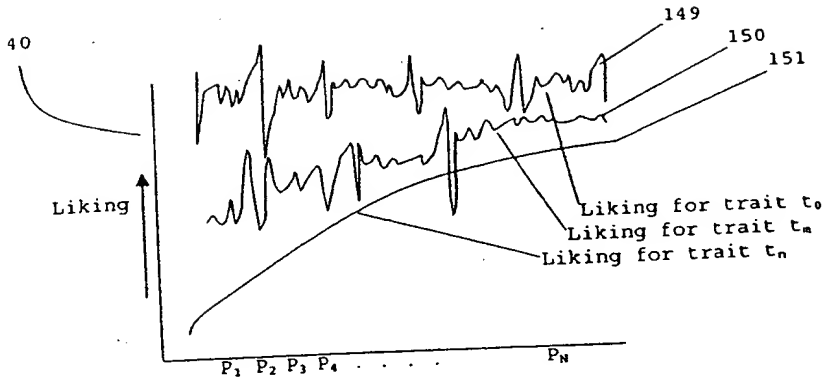
Next Liking Value

$\lambda a_2 = 1.5$
$\lambda a_1 = 5$
$\lambda a_1 = -3$
$\lambda a_1 = 0$



($\lambda b = \lambda b_1$
$\lambda c = \lambda c_1$
$\lambda d = \lambda d_1$
.
.
.)

Figure 8



t_m and t_n are correlated

t_m can be expressed as $t_m = t_x + t_m'$

and t_n can be expressed as $t_n = a_x t_x + t_n'$

Computing Traitness of a trait is a program 30

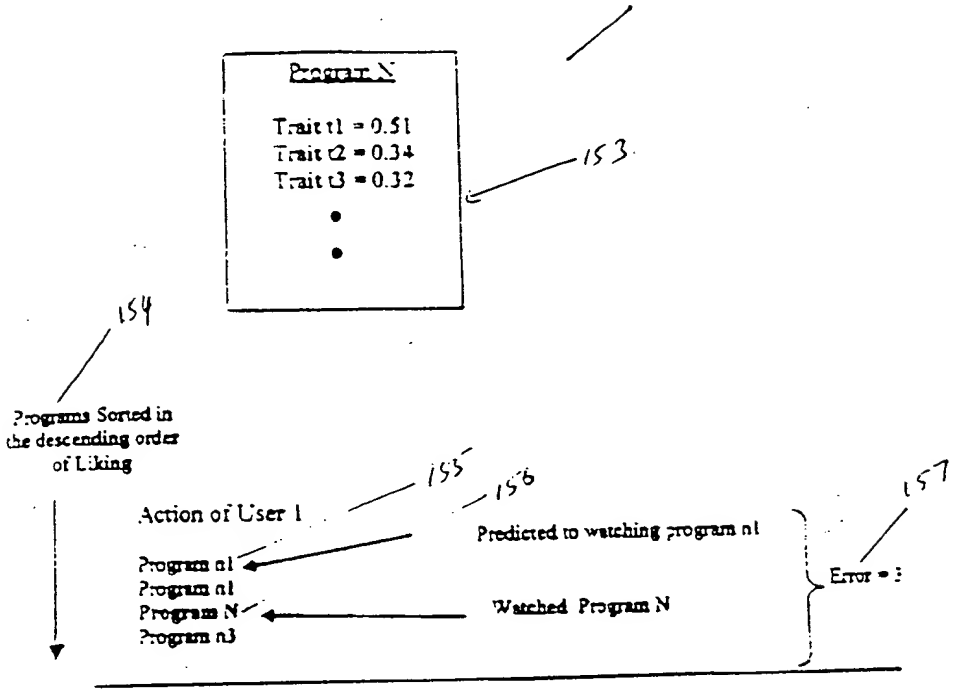


Figure 9(a)

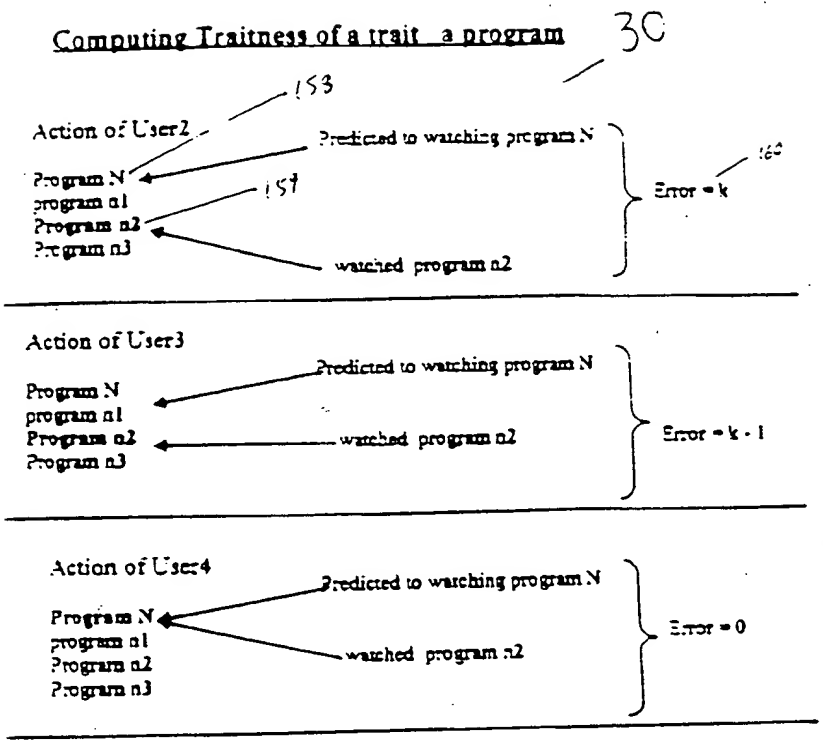
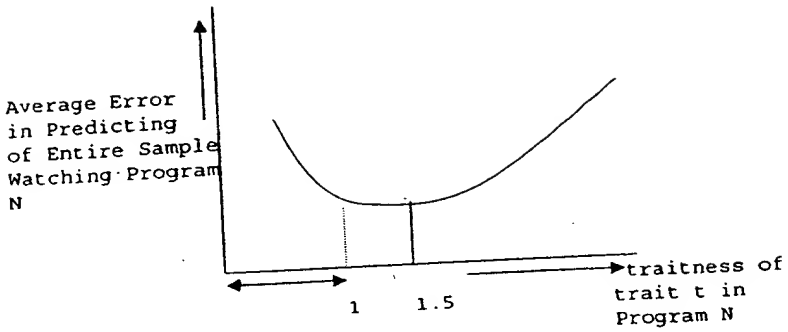

Computing Traitness of a trait a program
30
153
Action of User2
Predicted to watching program N
Program N
program n1
Program n2
Program n3
151
watched program n2
Error = k
160
Action of User3
Predicted to watching program N
Program N
program n1
Program n2
Program n3
watched program n2
Error = k - 1
Action of User4
Predicted to watching program N
Program N
program n1
Program n2
Program n3
watched program n2
Error = 0

Figure 9(b)

Figure 9(c)



Optimal value of traitness

e.g. comedy-ness in Seinfeld = 1.5
comedy-ness in Frasier = 0.89

Example for Liking Distribution Record format

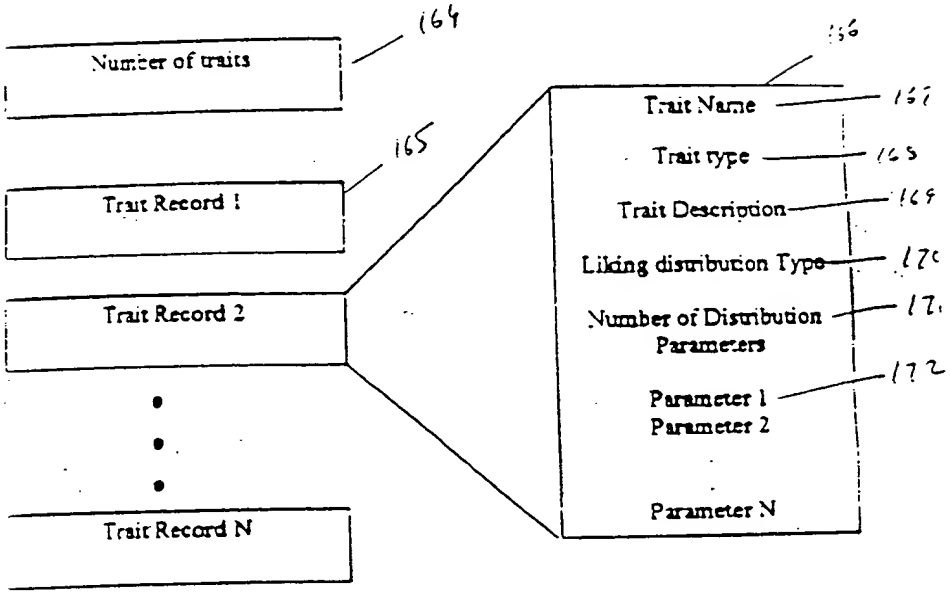


Figure 10

Some Sample Values For Fields in trait Record

Trait type	Trait Description
Static , dynamic Association Generated	(NBC , "NEWS"), SUBSTRING("CLA") IN DESC, TITLE

Distribution	Distribution Parameters
Normal Exponential Defined type 1 Defined type 2	Mean = 13, Deviation =2

Figure 11

Example for Traitness of recurring Programs

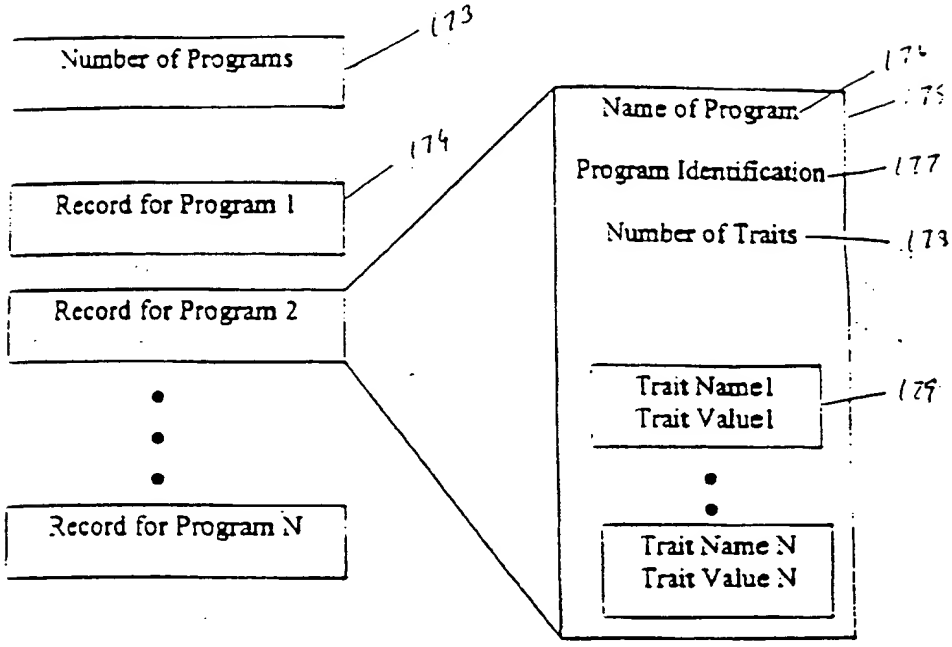


Figure 12

Example For Broadcasting traitness as a part of EPG Data

Program Info
Seinfield,
NBC ,
Comedy = 0.07
sitcom ,
Dynamic trait 1 = 0.1
•
•
Actor = Seinfield

Figure 13

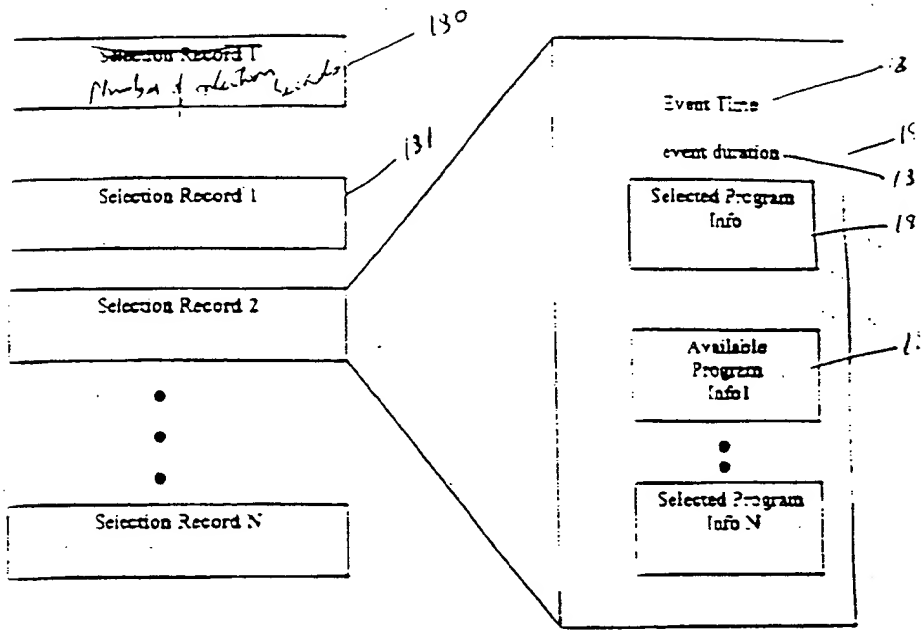

Example for Selection Record
130
Selection Record 1
131
Selection Record 1
Selection Record 2
Selection Record N
Event Time
event duration
Selected Program Info
Available Program Info1
Selected Program Info N

Figure 14

Generation of User Selection History

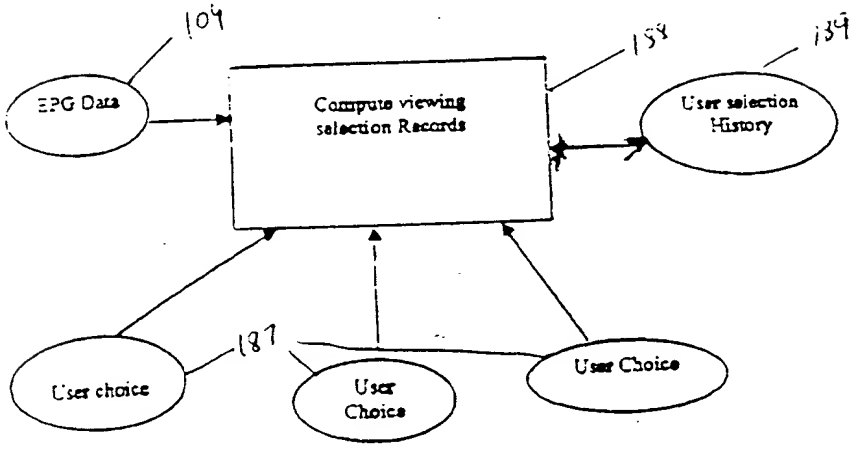


Figure 15

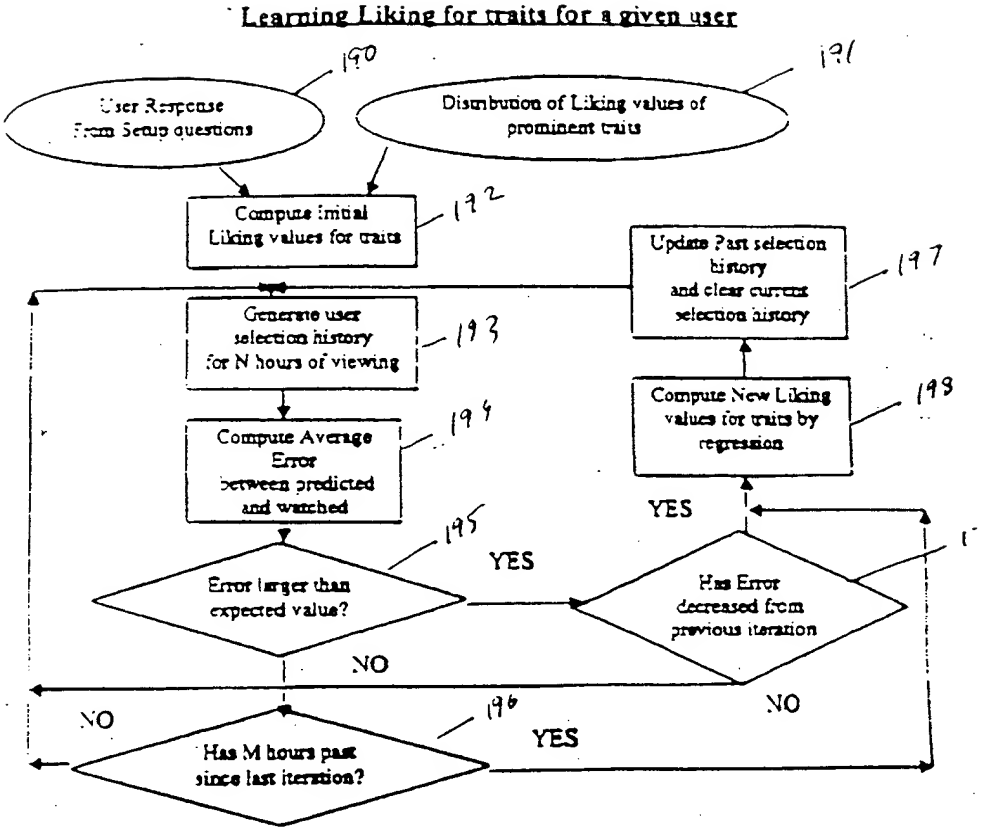

Learning Liking for traits for a given user
User Response From Setup questions
190
Distribution of Liking values of prominent traits
191
Compute Initial Liking values for traits
192
Generate user selection history for N hours of viewing
193
Compute Average Error between predicted and watched
194
Error larger than expected value?
195
YES
NO
Has M hours past since last iteration?
196
NO
YES
Has Error decreased from previous iteration
YES
NO
Compute New Liking values for traits by regression
198
Update Past selection history and clear current selection history
197

Figure 16

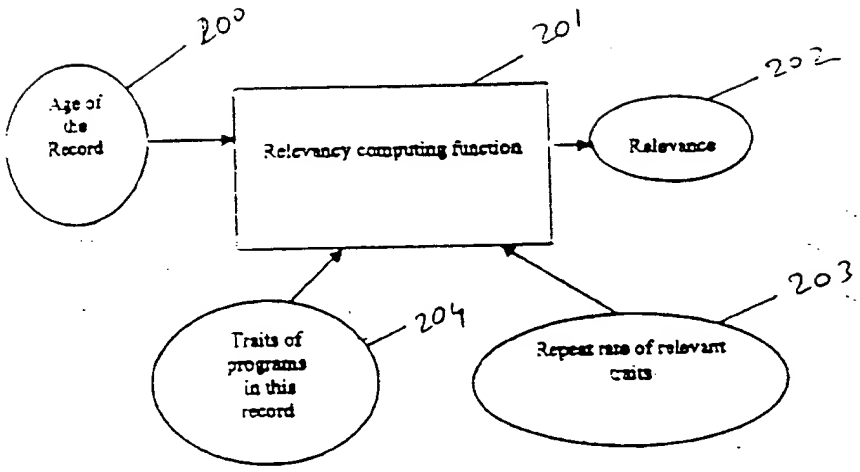

Computing Relevance
200
201
202
Age of the Record
Relevancy computing function
Relevance
203
204
Traits of programs in this record
Repeat rate of relevant traits

Figure 17 (a)

Figure 17(b)

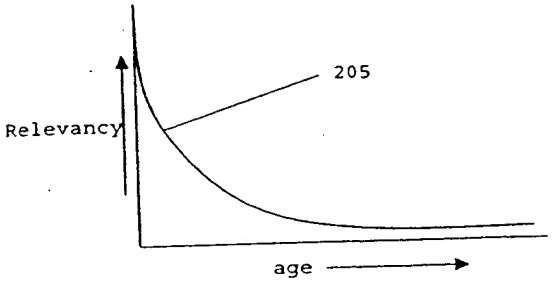
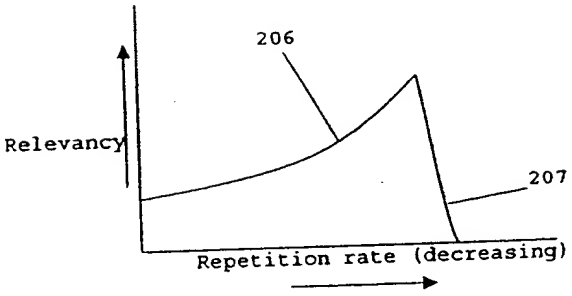


Figure 17(c)



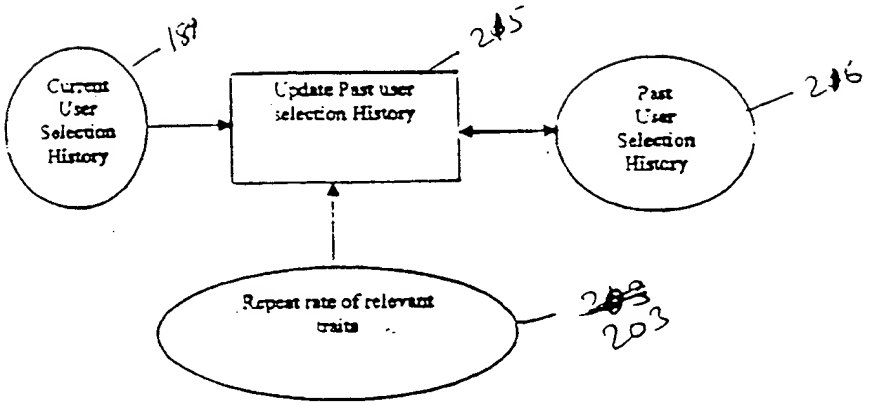

Updation of past History
Current User Selection History
Update Past user selection History
Past User Selection History
Repeat rate of relevant traits
203

Figure 18(a)

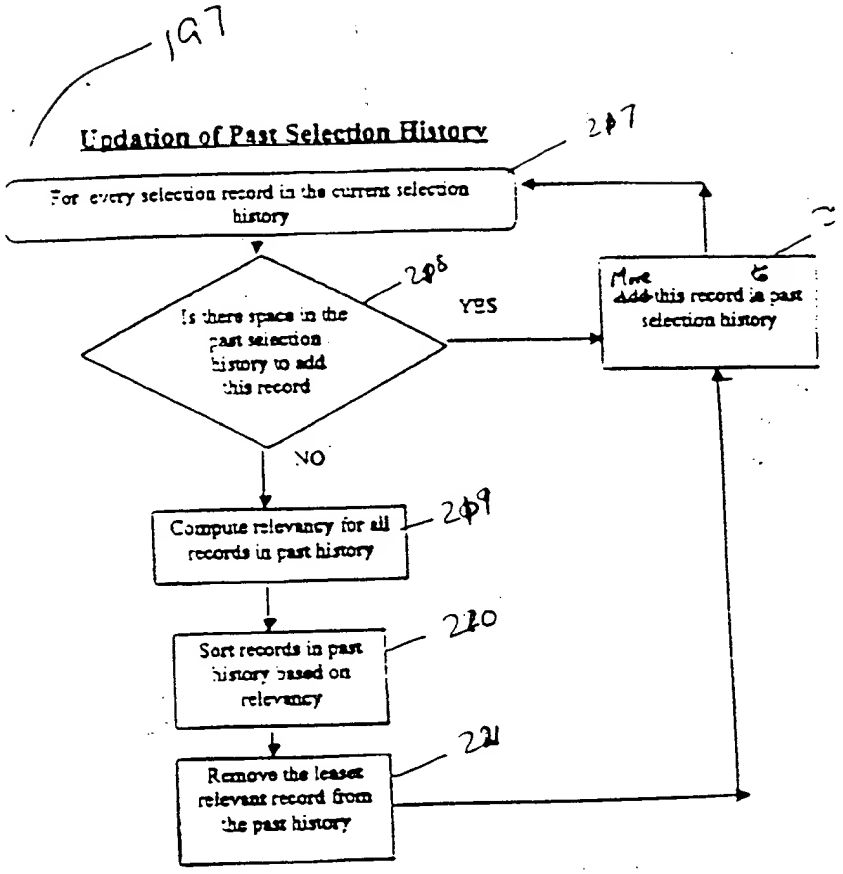

197
Updation of Past Selection History
207
For every selection record in the current selection history
208
Is there space in the past selection history to add this record
YES
Move & this record in past selection history
NO
209
Compute relevancy for all records in past history
210
Sort records in past history based on relevancy
211
Remove the leaset relevant record from the past history

Figure 18(b)

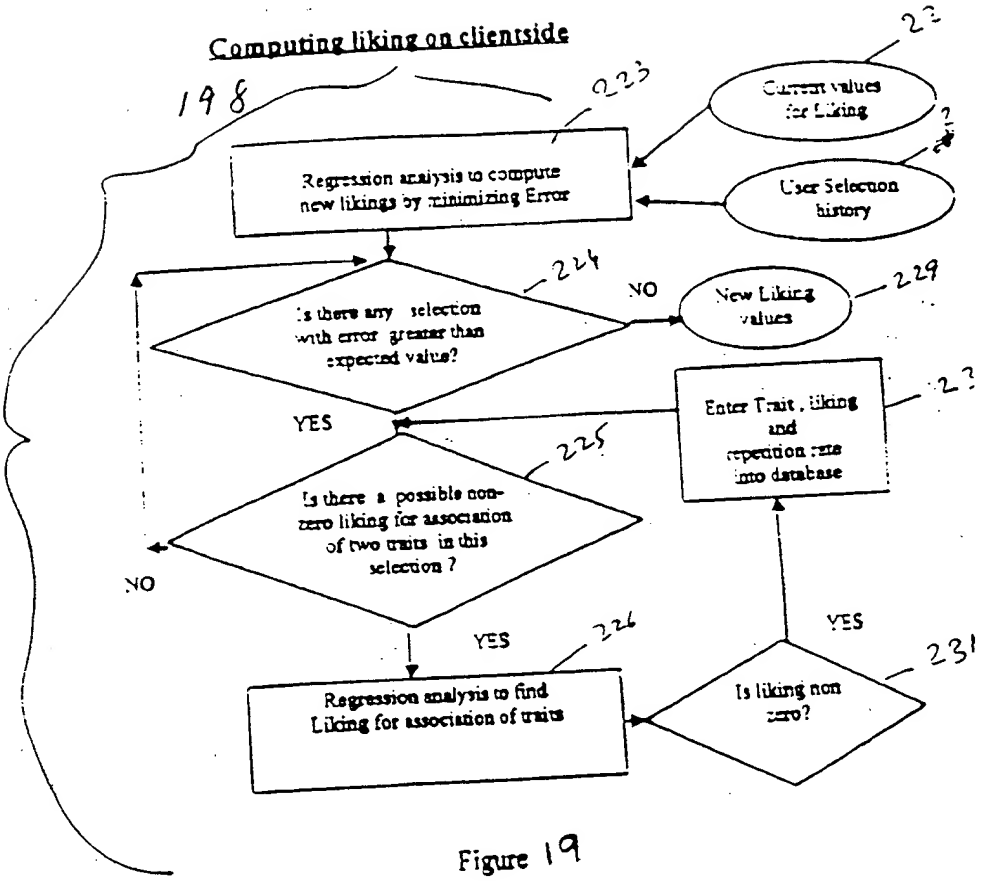

Computing liking on clientside
198
223
Regression analysis to compute new likings by minimizing Error
Current values for Liking
User Selection history
224
Is there any selection with error greater than expected value?
NO
New Liking values
229
YES
Enter Trait , liking and repetition rate into database
225
Is there a possible non-zero liking for association of two traits in this selection ?
NO
YES
226
Regression analysis to find Liking for association of traits
YES
Is liking non zero?
231

Figure 19

Computing scores for programs for future prediction

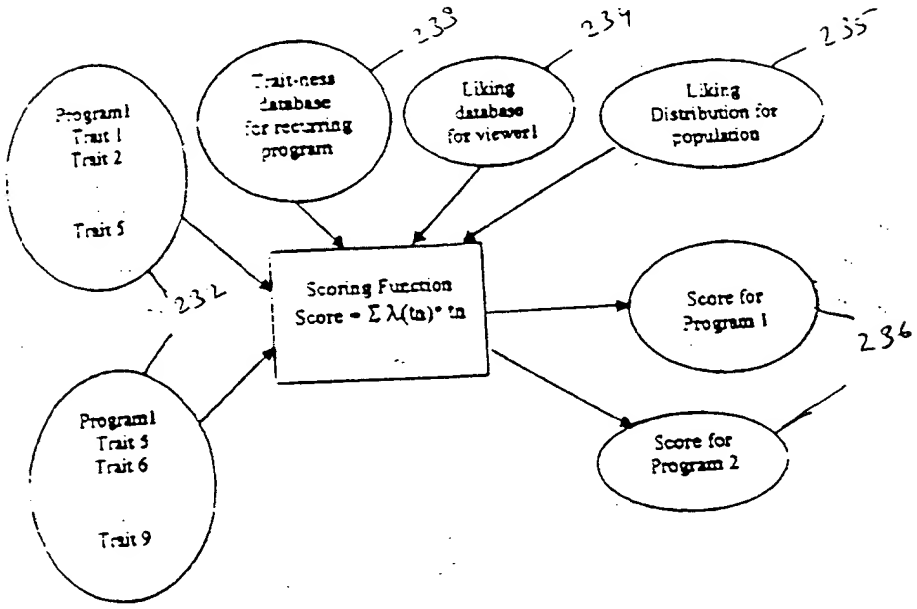
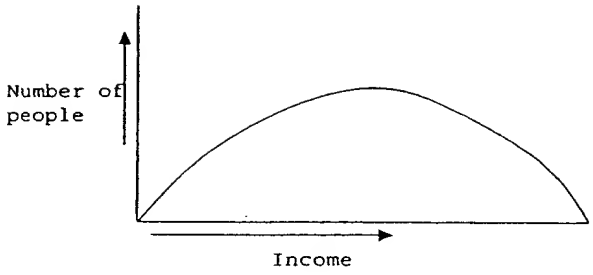
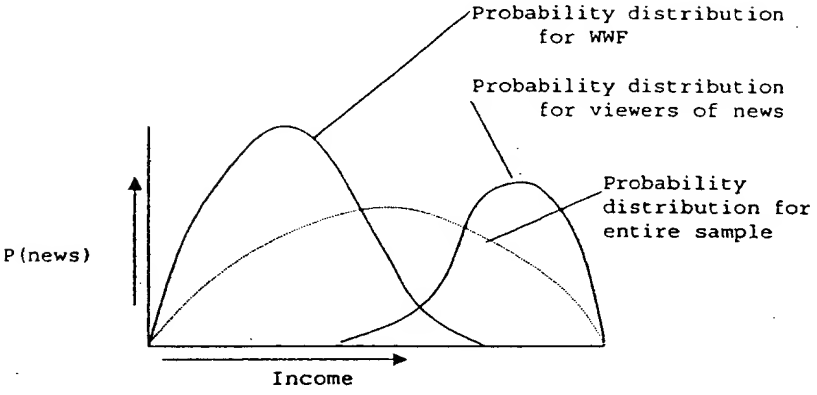


Figure 20

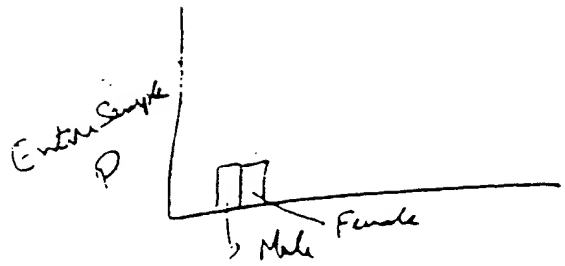
Figure 21(a)

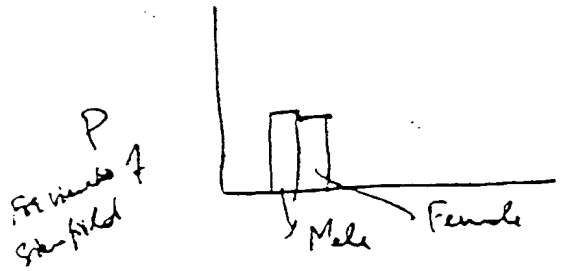


(i)



(ii)





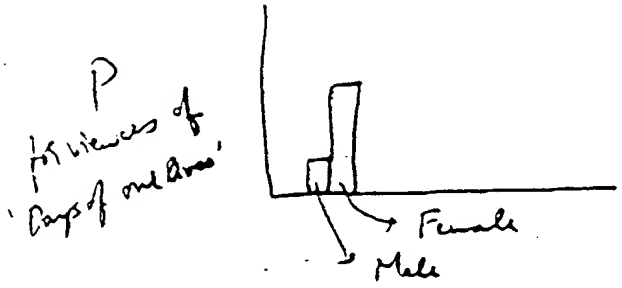


FIGURE 21b

System Architecture

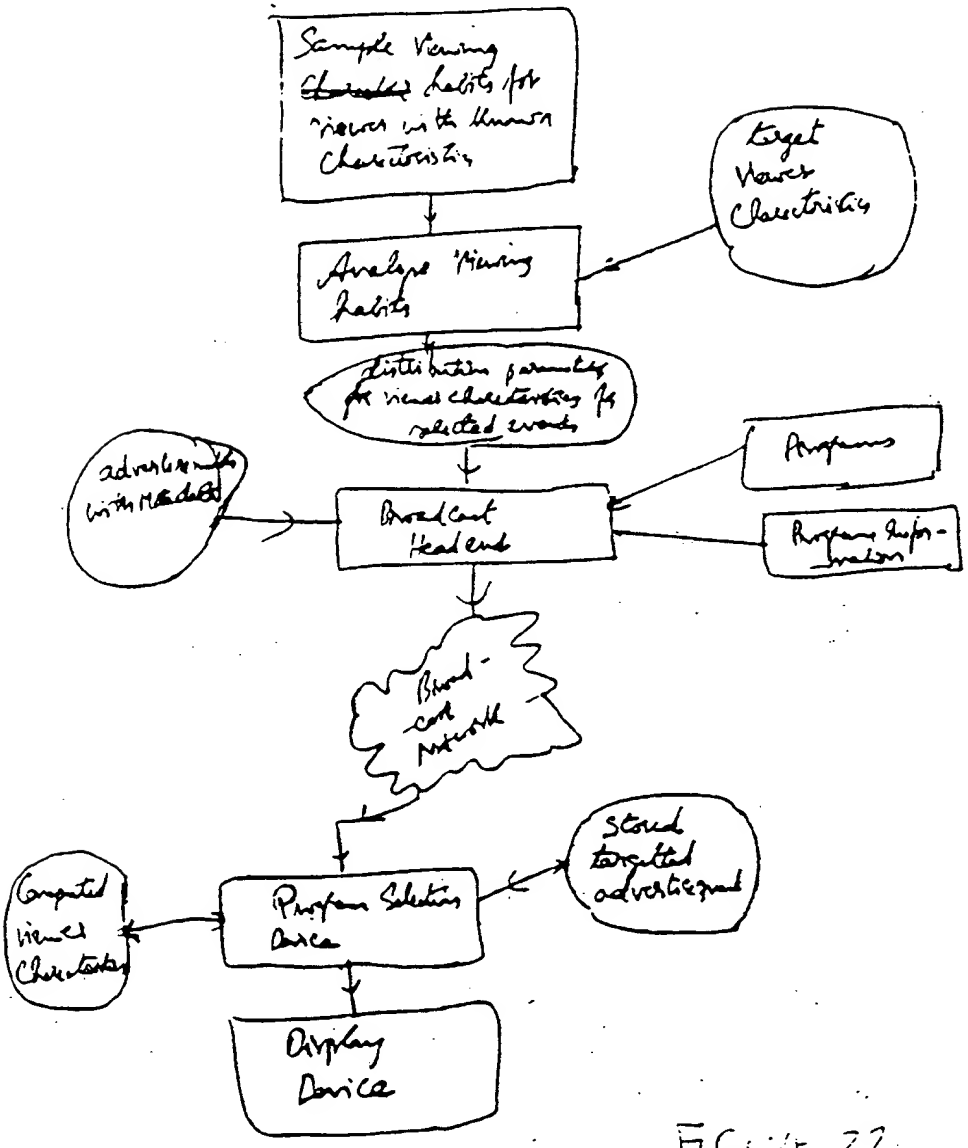


FIGURE 22

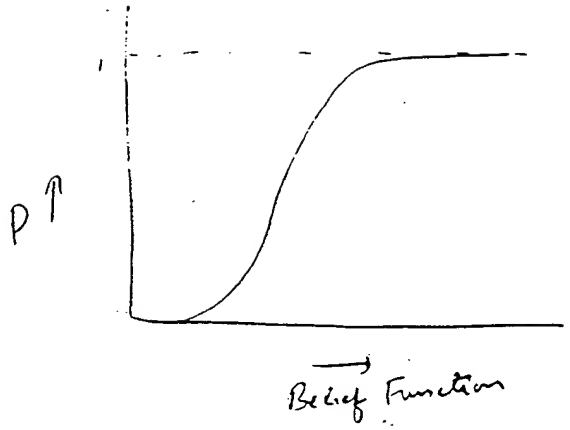


Figure 23a

Demographic Trait Record format

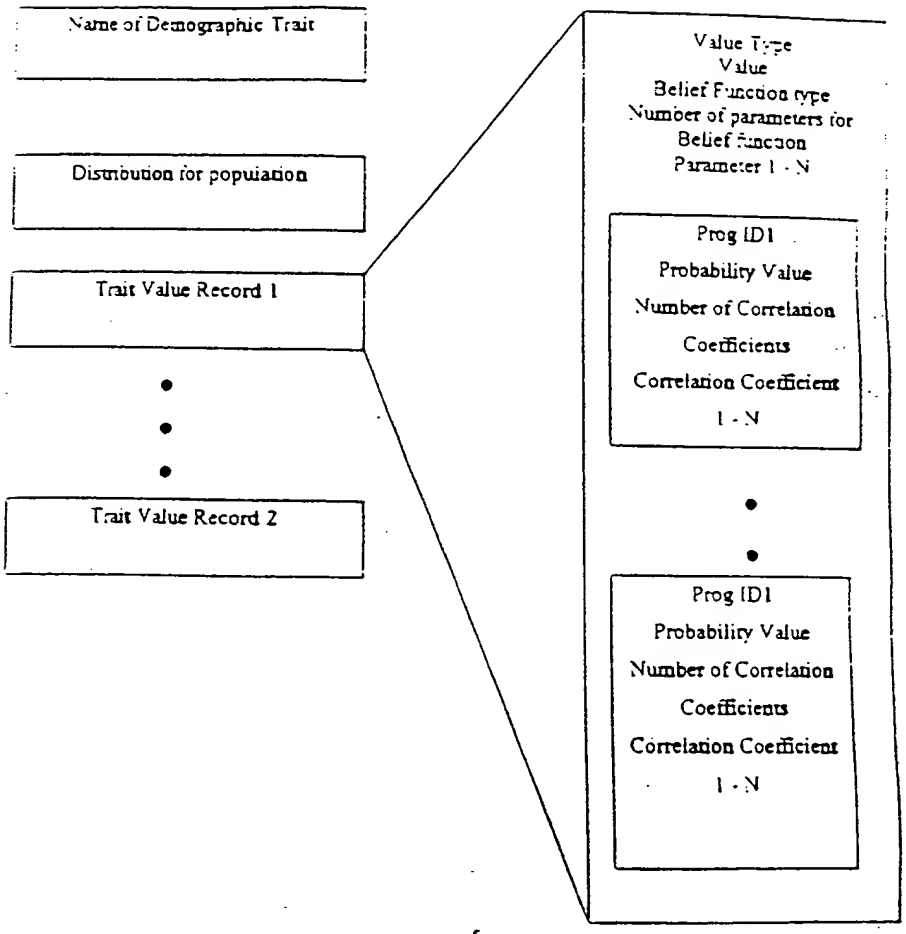


Figure 23b

Advertisement Targeting Record format

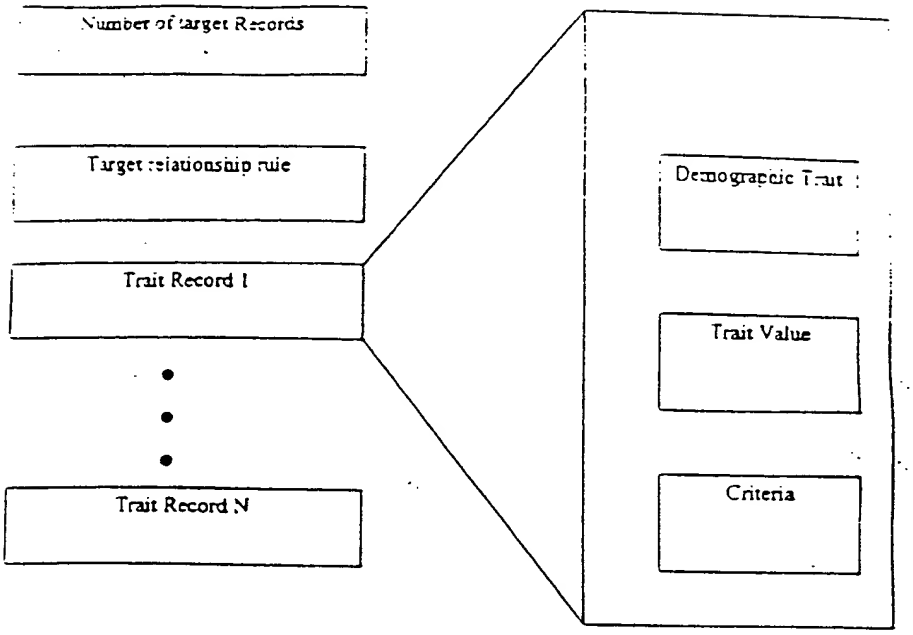


Figure 23C

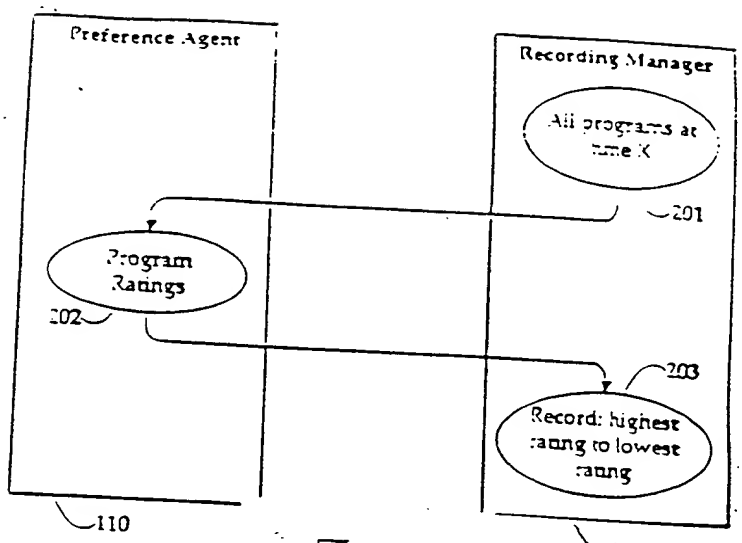


Figure 24

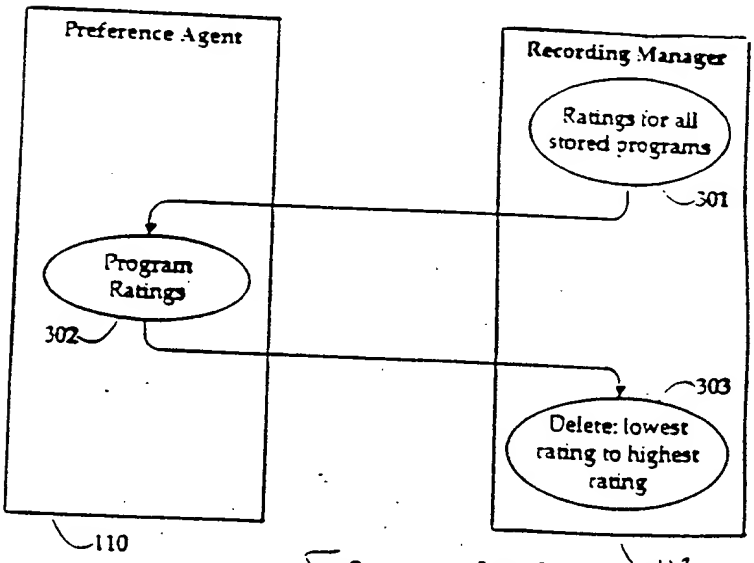


Figure 25

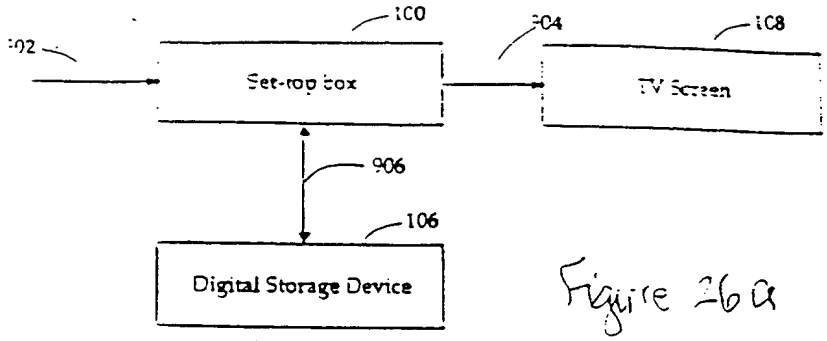


Figure 26a

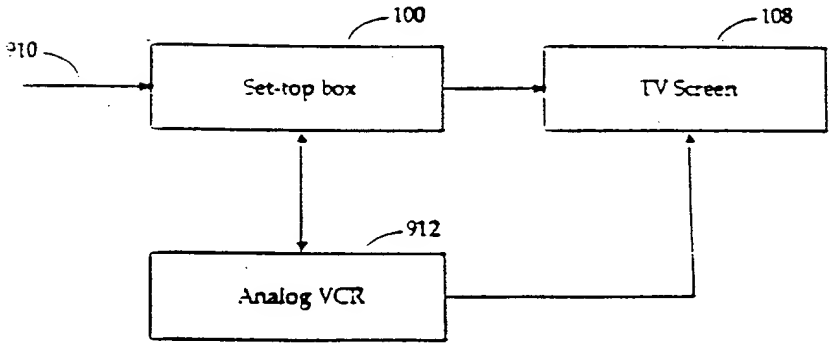


Figure 26b

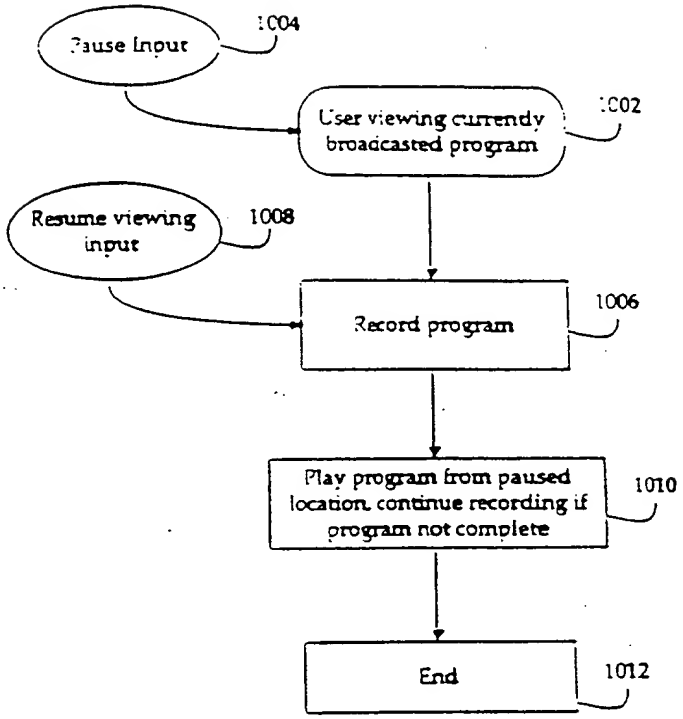

Pause Input
1004
User viewing currendy broadcasted program
1002
Resume viewing input
1008
Record program
1006
Play program from paused location, continue recording if program not complete
1010
End
1012

Figure 27

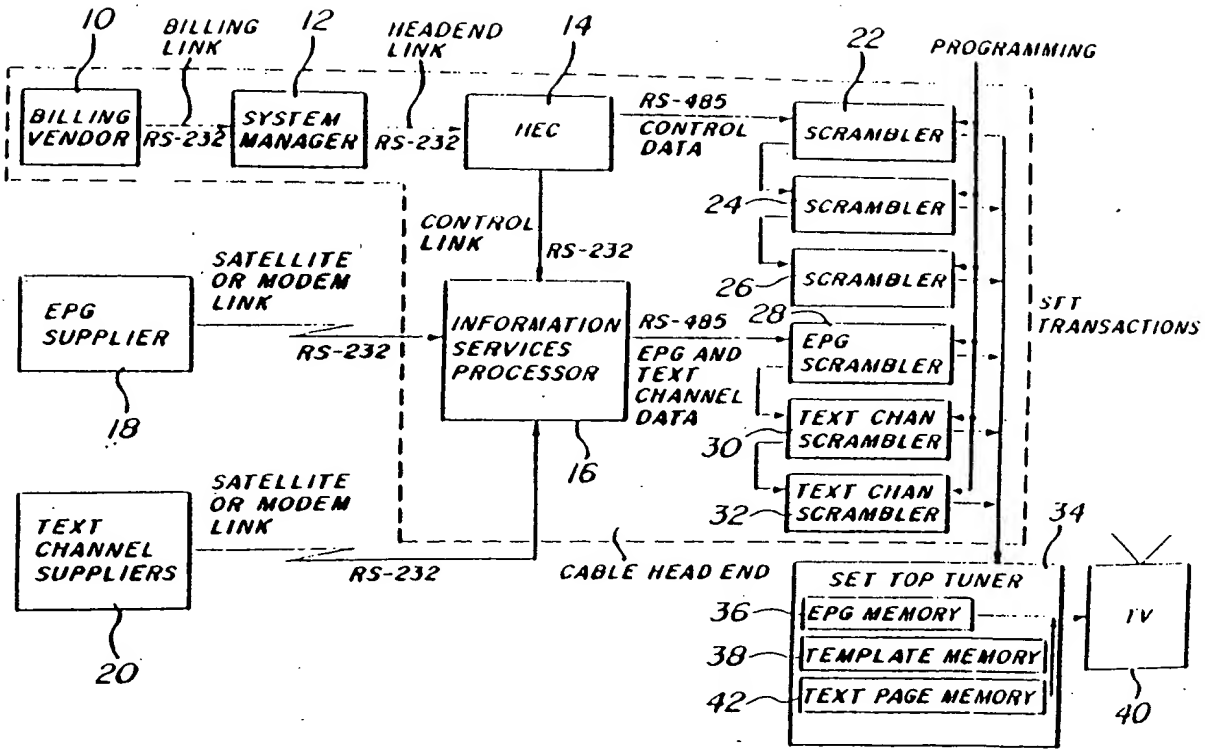

10
BILLING LINK
12
HEADEND LINK
14
22
PROGRAMMING
BILLING VENDOR
RS-232
SYSTEM MANAGER
RS-232
HEC
RS-485
CONTROL DATA
SCRAMBLER
24
SCRAMBLER
CONTROL LINK
RS-232
26
SCRAMBLER
SATELLITE OR MODEM LINK
EPG SUPPLIER
RS-232
INFORMATION SERVICES PROCESSOR
RS-485
EPG AND TEXT CHANNEL DATA
28
EPG SCRAMBLER
SFT TRANSACTIONS
TEXT CHAN SCRAMBLER
30
TEXT CHAN SCRAMBLER
18
16
SATELLITE OR MODEM LINK
TEXT CHANNEL SUPPLIERS
RS-232
CABLE HEAD END
32
34
SET TOP TUNER
36
EPG MEMORY
TV
38
TEMPLATE MEMORY
42
TEXT PAGE MEMORY
20
40

Figure 28

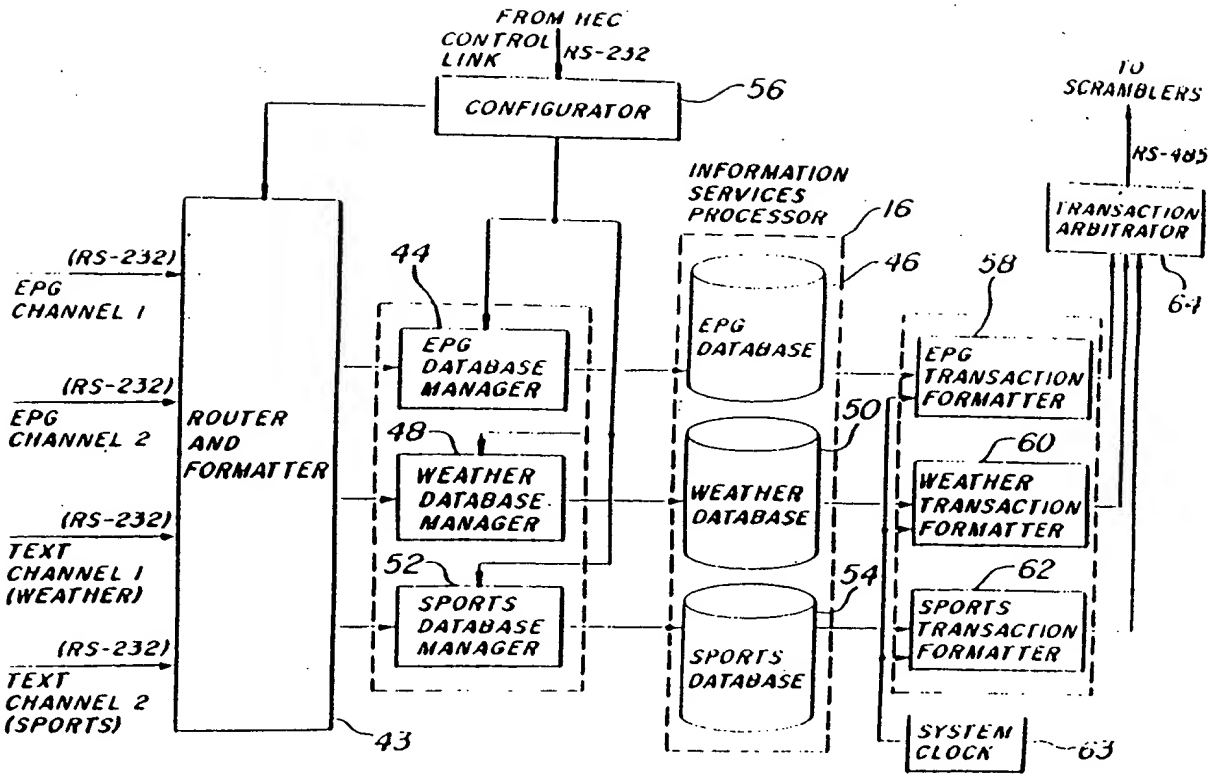

FROM HEC
CONTROL LINK
RS-232
CONFIGURATOR
56
TO SCRAMBLERS
RS-485
TRANSACTION ARBITRATOR
64
INFORMATION SERVICES PROCESSOR
16
(RS-232)
EPG CHANNEL 1
(RS-232)
EPG CHANNEL 2
(RS-232)
TEXT CHANNEL 1 (WEATHER)
(RS-232)
TEXT CHANNEL 2 (SPORTS)
ROUTER AND FORMATTER
43
44
EPG DATABASE MANAGER
48
WEATHER DATABASE MANAGER
52
SPORTS DATABASE MANAGER
46
EPG DATABASE
50
WEATHER DATABASE
54
SPORTS DATABASE
58
EPG TRANSACTION FORMATTER
60
WEATHER TRANSACTION FORMATTER
62
SPORTS TRANSACTION FORMATTER
SYSTEM CLOCK
63

Figure 29

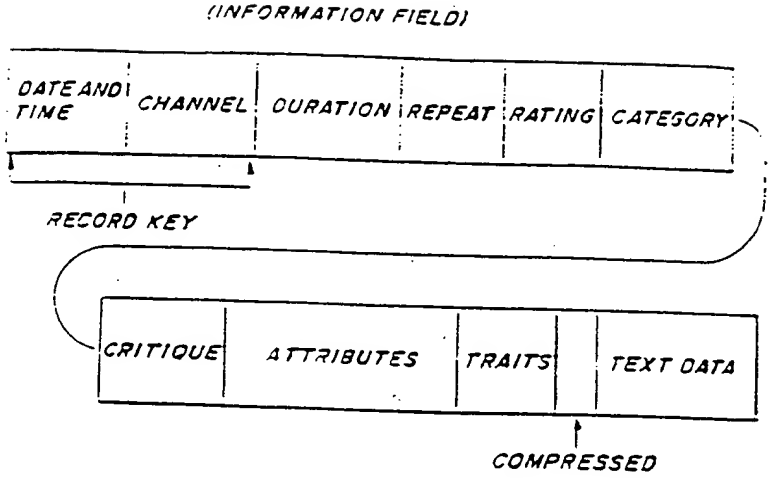


Figure 30

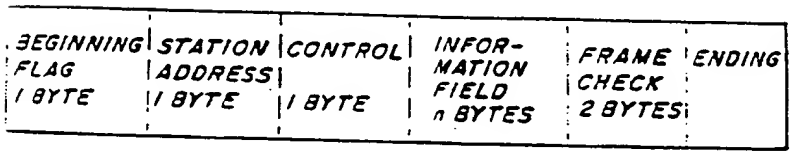


Figure 31

EPG TRANSACTION FORMATTER 58

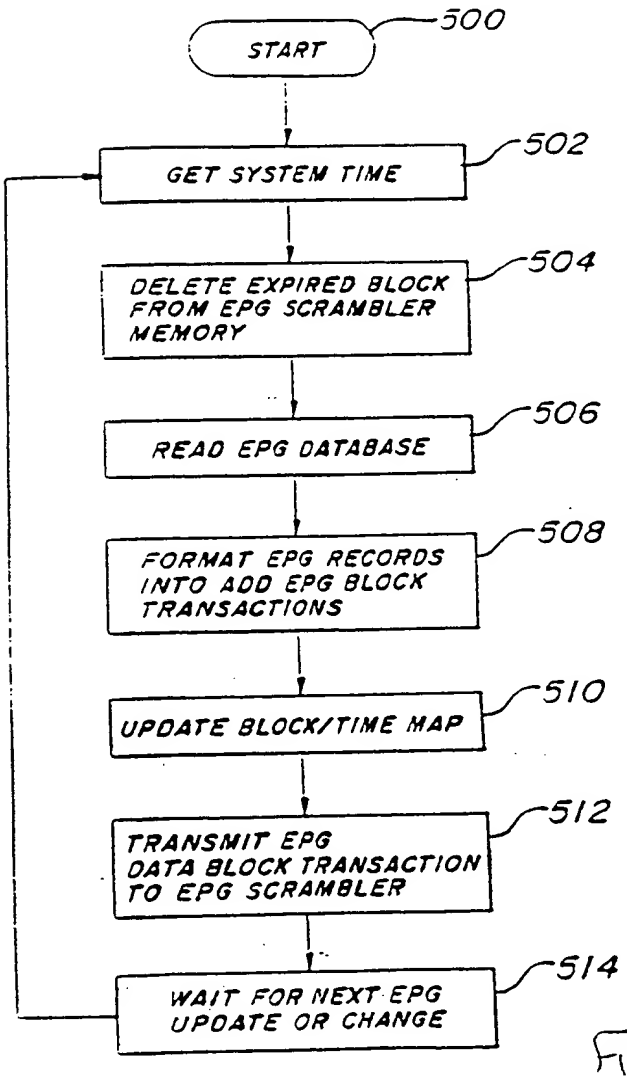


Figure 32

TEXT CHANNEL TRANSACTION FORMATTER 60,62

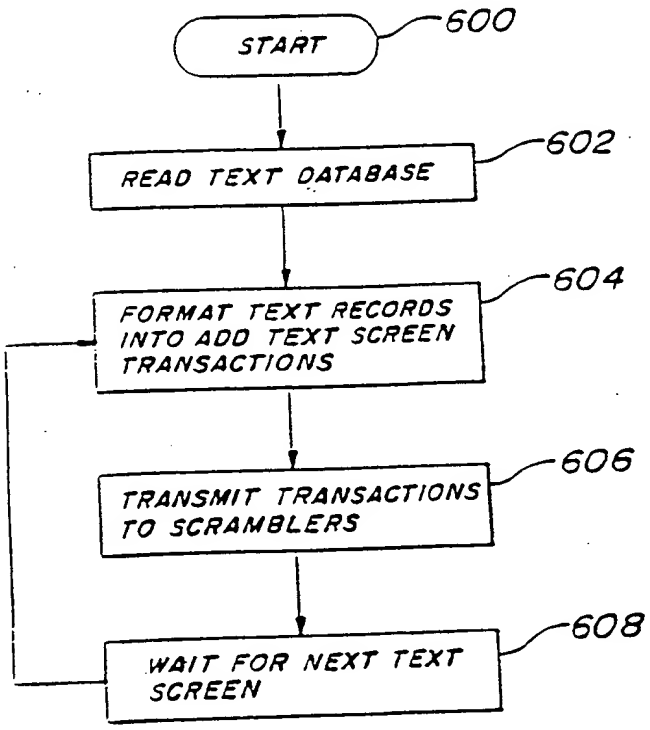


Figure 33

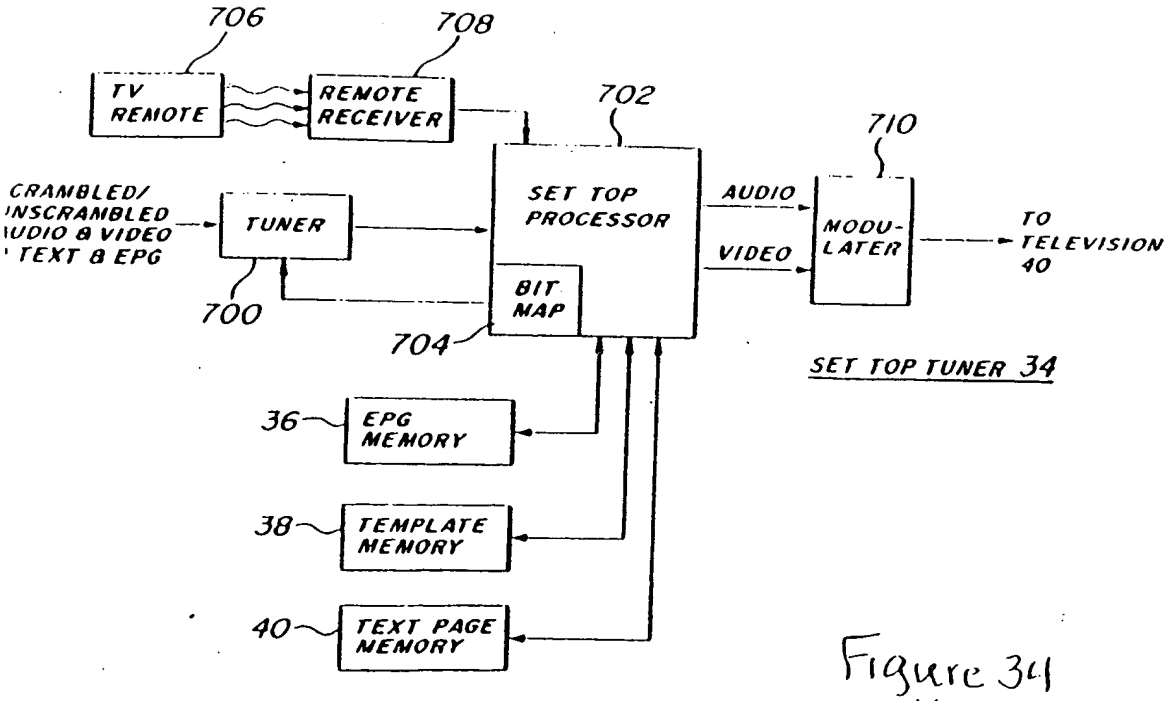

706
708
TV REMOTE
REMOTE RECEIVER
702
710
SET TOP PROCESSOR
AUDIO
VIDEO
MODU-LATER
TO TELEVISION 40
CRAMBLED/ NSCRAMBLED UDIO & VIDEO TEXT & EPG
TUNER
700
BIT MAP
704
SET TOP TUNER 34
36
EPG MEMORY
38
TEMPLATE MEMORY
40
TEXT PAGE MEMORY

Figure 34

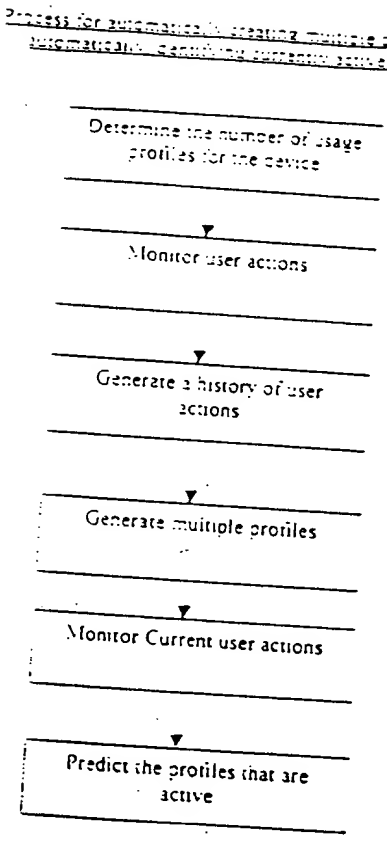

Process for automatically creating multiple profiles and automatically identifying currently active profiles
Determine the number of usage profiles for the device
Monitor user actions
Generate a history of user actions
Generate multiple profiles
Monitor Current user actions
Predict the profiles that are active

Figure 35

CIRCULAR PROGRAM GUIDE

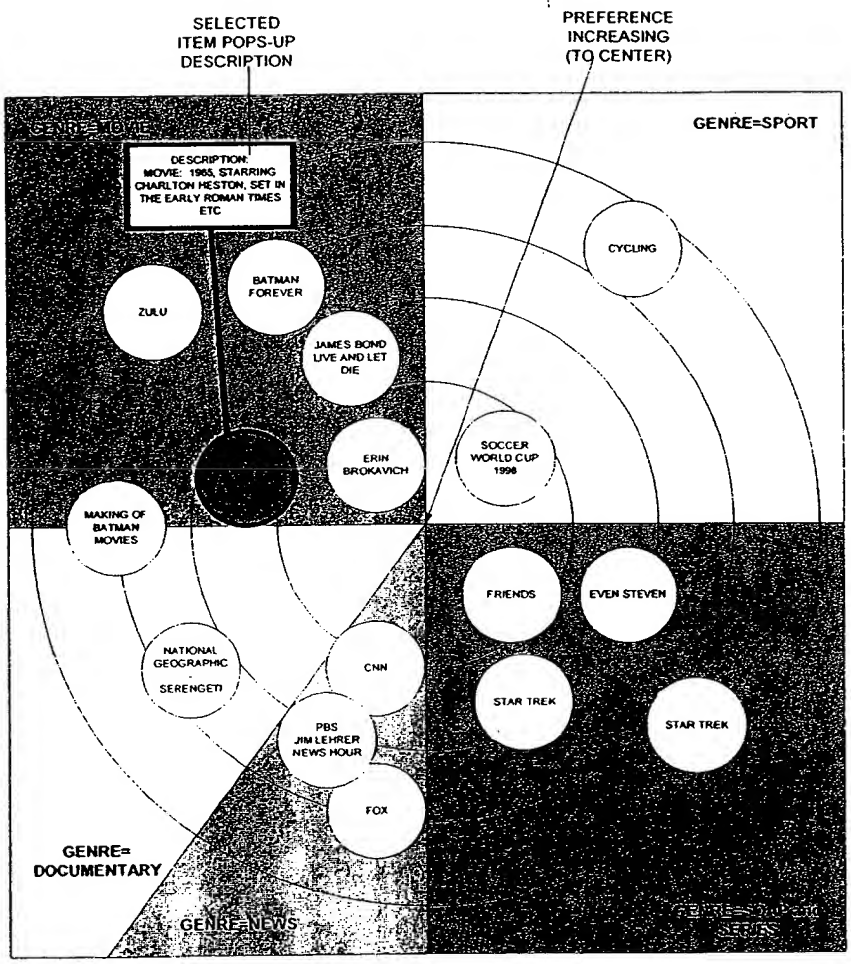


Figure 36